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MEMO

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Date:
July 25, 2008

Subject:
Response to MDEQ Questions

Following are responses to questions MDEQ had regarding the Michigan State University (MSU) studies based on MSU's May 13, 2008 presentation to the Peer Review Panel.

1. **Comment:** Doesn't nest box placement attract birds into an area at rates that may affect natural density? (That is, natural nest site availability probably limits or controls breeding pair density.)

Response: It is true that species such as house wrens, eastern bluebirds, and tree swallows tend to use nest boxes when available in preference to "natural" sites. In addition, we observed that for selected floodplain habitats like emergent marsh, emergent grass, and emergent shrub there was little to no natural nesting habitat available and nesting opportunities were limited. The MSU nest boxes were quickly filled and it is likely that they allowed the existing habitats to support additional birds that otherwise would not have been there. This is not true of other species of potential interest, such as robins, which will not use nest boxes even when available, thus precluding our ability to encourage that species to nest in the study area despite the limited availability of natural nest sites. However, even though the placement of nest boxes may have increased the local density of certain species somewhat, the nest box studies were meant to be comparative in nature and are not intended to provide absolute information on population densities. The hypotheses being tested focused on the relative differences in exposure, individual health, various measures of productivity, nesting behavior, etc. between the former Trowbridge Impoundment and the reference location. Therefore, the experimental design was structured to minimize as many other variables as possible, including the available nesting habitat. The nest boxes were deployed within the 100-year floodplain, most often

within 10 m of the river (see Figure 1-2 of the Summary of MSU Studies, Section 3 of the Charge and Supporting Materials Binder), to encourage the nesting birds to feed in the areas of the exposed sediments and thus be exposed to prey from the most contaminated locations.

In addition to the availability of suitable nesting sites, the territoriality of house wrens, eastern bluebirds, and tree swallows also plays a large role in determining the density of birds in an area. In both the reference area and the former Trowbridge Impoundment, the boxes were spaced based on historical observations of densities that the birds will tolerate. Not all of the boxes that were “available” in each area were actually used.

The use of nest boxes to facilitate observation, monitoring, and sample collection is a technique that is often used by researchers, including the Department of Interior, USEPA, and their contractors, to monitor populations of birds at contaminated sites. The protocols we used at the Kalamazoo Site were standard methods similar to those we and other researchers have used at other sites (Ankley et al, 1993; Jones et al. 1993; Bishop et al, 1999; Custer et al. 2002, 2003; Secord and McCarty, 1997; Secord et al., 1999 Harris and Elliot, 2000). It should be noted that no significant difference in the rate of box occupancy was noted between the former Trowbridge Impoundment and the reference area, and not all of the nest boxes placed in each area were used. Based on this information, it seems unlikely that the use of nest boxes significantly increased the number of birds nesting in those areas or otherwise compromised the relative information obtained between the target and reference areas.

2. **Comment:** MSU studies showed high variability in bird diet by location. Does that not limit extrapolation of bird dietary and BAF data from one location to another?

Response: Environments are patchy by nature and birds in different areas will make use of the diets available in the area of their nests, adapting to those locally available prey items that are appropriate to their specific feeding guild. The diets of the birds in the study did differ among species and between sites as would be expected based on their different locations within the watershed; however, more relevant than the specific prey items consumed is the dietary dose of PCBs received by the birds at each location. Looking at the diets on a species-specific or feeding guild basis, there was similarity in the dietary items taken and an even greater overlap in PCB concentrations among dietary items within each location. Based on this information, we conclude that the data are robust and flexible enough to develop BAFs.

3. **Comment:** CDM collected large numbers of worms from all TBSAs. Since worms undergo a vertical migration as soil moisture changes, they may have simply been deeper at the time of collection. We suggest worms are indeed common in the floodplain at all TBSA locations.

Response: Worms do respond to soil moisture and tend to be scarce in surface soils at times when soils are dryer and extirpated when soils are saturated. This is consistent with our observations

throughout the different seasons evaluated during our investigation. Our experience with worm abundance within the study areas was that they were typically present, but with different frequencies depending on time of year and Site-specific conditions. Worms were least available (almost non-existent) in early spring at the time of egg drop or just after the floodplain transitioned from aquatic to terrestrial. As the seasonal flow decreased and the floodplain dried out, worms became more plentiful, specifically in early summer (June) and fall (Sept) after fledge. This is consistent with the results reported in the Final BERA (CDM, 2003), which indicated that worms were relatively abundant in the summertime. While it may have been possible, as observed by CDM, to collect more worms during the dryer summer months, our sampling efforts were focused on evaluating prey tissue concentrations that would be available to our selected receptor species during critical life stages (e.g., periods of egg development and growth of juveniles).

4. **Comment:** Geometric means were used in some calculations to develop accumulation factors and hazard quotients. Yet there is broad consensus, including in USEPA guidance, suggesting that exposure and hence risk is proportional to the arithmetic average of concentration in media, averaged over space and time. Consequently, risk management decisions will be based on reduction of arithmetic average sediment concentrations. As such, cleanup values, often referred to as preliminary remedial goals (PRGs), which are generally derived as a function of hazard quotients and other accumulation factors, will be expressed as arithmetic averages. Therefore, in order to properly apply the MSU derived accumulation factors, TRVs, and HQs, the selection of geometric means as opposed to arithmetic means may be inappropriate. This is particularly true for the sediment portion of these factors.

Response: The raw data have been provided in the database for the panel's review and consideration and can be evaluated based on whatever summary statistic is deemed appropriate. It should be noted that the purpose of the peer review is to evaluate the quality and usability of the data that were collected rather than merely the conclusions that were reached. Furthermore, several members of the review panel also suggested that the more appropriate indicator of central tendency might be the geometric mean, rather than the arithmetic mean. From a statistical perspective, the shape of the frequency distribution determines the most appropriate indicator of central tendency. In over-dispersed (skewed distributions), which is often the case for concentrations of residues in the environment, the geometric mean is a less biased estimate of the central tendency.

5. **Comment:** It is our understanding that reproductive data collected in the first year of the studies was not included in the published studies. We believe the Peer Review panel should consider these data in their review.

Response: The first year reproductive data were not included for several reasons – the primary reason being that a complete or interpretable data set was not collected. The first year of the study was meant to establish the nest box trails in the study areas, validate field protocols, and test for

species occupancy and sample size availability. Some of the activities conducted were focused on establishing protocols, finalizing selection of species to be evaluated, and training the students and student aides in the methods to be used. For example, the original study design included evaluation of starlings, at the request of MDEQ. Unfortunately, during the first year of the investigation this species was determined to not be present in the areas of interest, and the study design was modified accordingly.

In addition, it has been documented that the first year a nest box trail is established, occupancy can be less than in later years (Secord and McCarty, 1997). Furthermore, new nest boxes are frequently occupied by first year breeding adults, which are typically less mature and less experienced than some pairs that have previously bred at a site, and can therefore be less successful (Secord and McCarty, 1997).

For these reasons, it is our standard approach to assume that the data collected during the initial season of a multi-year study will be incomplete and not appropriate for interpretation. This is reflected in the Standard Operating Procedures prepared for this investigation and provided in the Charge and Supporting Materials Binder, where we indicate that nest monitoring will begin during the second breeding season after placement of the nest boxes. In addition, the reference area nest box trails included in this investigation had been continually maintained by MSU and the Kalamazoo nature center for 18 years prior to the initiation of the study within the former Trowbridge Impoundment.

For these reasons we concluded that it would be inappropriate to directly compare the first year results from the Trowbridge nest boxes with the established trail at the reference area. However, these data can be provided for review at the Panel's request.

6. **Comment:** It is our understanding that Great Horned Owl productivity data were available for several sites, although the data presented by MSU included only Trowbridge and the reference site. Again we believe that all data should be available to the Peer Reviewers and included at their discretion.

Response: Data for the Great Horned Owl were collected from seven locations. The more upstream locations (Fort Custer and Ceresco) are referred to as the reference locations. The remaining five locations are located in two sub-regions of the Kalamazoo River Study Area, defined as the Upper Kalamazoo River Study Site (UKRSS) and the Lower Kalamazoo River Study Site (LKRSS). As explained in the Summary of MSU Studies (Section 3 of the Charge and Supporting Materials Binder) provided to the panel, the habitat associated with the LKRSS is very different from that of the formerly impounded areas, which are the focus of this peer review. Therefore, the data from the LKRSS were not included in that summary and the KRSR and USEPA agreed that the panel not be asked to consider them.

7. **Comment:** It was stated that passerine nesting boxes were located within the 100-year floodplain. As we described the exposed sediments are a subset of the 100-year floodplain and there are dramatic differences in PCB concentration in the exposed sediments relative to other floodplain soils that were not previously impounded behind dams. We believe that only those nest boxes located within the exposed sediments should be used to describe risks associated with the exposed sediments. Inclusion of nest boxes outside the exposed sediments would be expected to understate risks associated with the exposed sediments.

Response: The nest boxes were deployed within the 100-year floodplain, most often within 10 m of the river (see Figure 1-2 of the Summary of MSU Studies, Section 3 of the Charge and Supporting Materials Binder). The goal of the nest box placement was to encourage the nesting birds to feed in the areas of the exposed sediments and thus be exposed to prey from the most contaminated locations. The raw data associated with each nest box is available to the panel and they are free, based on criteria of their choosing, to select those boxes that they would like to include in their analyses and those that they would like to leave out.

8. **Comment:** Owl response rates were used to form the basis of relative population density comparisons for Great Horned Owls. In natural conditions, it is well known that such surveys are subject to a host of potential biases that may confound interpretation of results. These biases are exacerbated by the known locations of nesting pairs on artificial platforms. We believe the Peer Reviewers should consider this potential bias in their evaluations.

Response: We acknowledge that there are potential biases associated with the data obtained from the owl response surveys. However, it should be noted that these surveys represent only one line of evidence in our evaluation of the Great Horned Owl. They were done every 500 m over the entire corridor of river for both the study area and reference area and used to identify Great Horned Owl foraging and breeding territories, aid in nest platform placement, monitor fledging success and survival, and establish relative abundance. The underlying data have all been provided to the panel for independent evaluation.

9. **Comment:** Robin PCB accumulation factors were apparently calculated by matching tissue/egg concentrations from robins shot in the floodplain with sediment concentrations measured in exposed sediment. It was stated that robins were actually feeding outside the exposed sediment areas on a nearby golf course or other lawn areas. Based on floodplain data collected outside the exposed sediment areas PCB concentrations are lower than in the exposed sediments. Using exposed sediment data to calculate accumulation factors would result in understatement of accumulation factors.

Response: It was noted during the May 2008 meeting that the majority of the robins observed during the investigation were foraging outside the floodplain area because of the limited available habitat within the areas of formerly inundated soils. However, the robins collected for the purpose of evaluating tissue chemistry were collected from nests proximal to the river, within the former impoundments and in areas where they would have to travel the furthest distance to forage outside the floodplain in an attempt to collect robins that would represent maximal robin exposure at the site.

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